Update from 7/27/2017 Daniel Bowden

Ambient noise cross correlation and work towards a velocity model



Processing Notes and Details

- Prefilter 0.1 10 Hz
- A number of signal processing tricks employed to clean results. Basic goal is to suppress all transient signals (earthquakes).
 - Time domain normalization (divide trace by smoothed version of itself)
 - Frequency domain normalization (whitening)
- 1 hour segments with half hour overlap, average a whole day.
- Average all days together weighted by similarity (covariance)
- All processing treating 9-components of a given pair equally (ZZ, ZN, ZE, etc.)



Result is cleaner correlations:

Raw, for 15 days

Preprocessed, for 15 days





Side note: Time Glitches

- Comparing each to another showed occasional times when timing was off by ~0.2sec...
 - Problem with day-volumes? Glitches below occur on days when there was some power interrupt and day-volume is broken into two.



RRDG drift ~1sec as of August 2016

800 RRDG HHZ.*HHZ, filt: 1-2



For noise cross-correlation, problem fixed by simply down weighting bad days.



Looking at Surface Wave Dispersion Curves... Some are great, most are messy

SHL – TPK

Rayleigh Group Rayleigh Phase 4.75 4.5 4.5 4.25 1.75 1.5 1.5 1.25 1 0.2 0.4 0.6 0.8 1.2 1.4 1.6 1.8 1.4 0.2 0.4 0.8 1.2 1.6 1.8 0.6 Period (s) Period (s)

Note: Lateral 2D distance used for surface waves

SHL – TPK





Quick Bonus: Look for Direct P or S wave?





B2000.HHL-B4850.





A 3D Look, 1 Second Period (Is a 1D Velocity model for Homestake reasonable?)



A 3D Look, 0.15 Second Period



Some of the "Best":



Collected, can lead to a 1D model

Iterate to solve for 1D model that fits dispersion curves

(This is preliminary)



In relation to eigenfunctions...

How much does this change things?





More at: http://web.gps.caltech.edu/~dbowden/Eigenfunctions/